

# Delayed-Onset Digital Ischemia After Local Anesthetic With Epinephrine Injection Requiring Phentolamine Reversal

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The use of low-dose epinephrine in hand surgery has made it possible to perform a wide range of surgical procedures in the office setting. Low-dose epinephrine use is safe, and its vasoconstrictive effects are reversible with phentolamine. In this report, we present late-onset finger ischemia beginning 3 hours after an ipsilateral carpal tunnel and A1 pulley release of the middle finger anesthetized with local anesthetic and low-dose epinephrine (1:100,000). Finger ischemia lasted 14 hours until rescued with phentolamine injection. (*J Hand Surg Am.* 2017; ■(■):1.e1-e4. Copyright © 2017 by the American Society for Surgery of the Hand. All rights reserved.)

**Key words** Anesthesia, carpal tunnel syndrome, digital ischemia, epinephrine, phentolamine.



THE USE OF LOW-DOSE EPINEPHRINE in hand surgery has gained popularity because it provides excellent hemostasis, which eliminates the need for a tourniquet, sedation, and the risks and costs associated with sedation and general anesthesia.<sup>1</sup> Procedures performed under low-dose epinephrine are safe, as confirmed in a large multicenter study, demonstrating no instance of digital tissue loss or infarction and no case requiring the injection of phentolamine, an  $\alpha$ -blocking agent.<sup>2</sup> In cases in which finger ischemia lasts more than an hour after the procedure, it is recommended to use phentolamine to reverse the vasoconstrictive effects of epinephrine.

We present a case of low-dose (1:100,000) epinephrine-induced digit ischemia that was successfully reversed with phentolamine administration.

## CASE REPORT

A right-handed 65-year-old woman nonsmoker presented with symptoms consistent with bilateral carpal tunnel syndrome and stenosing tenosynovitis of the right middle finger. The diagnosis of carpal tunnel syndrome was confirmed with physical examination and nerve conduction studies. Her comorbidities included coronary artery disease previously requiring 4 stent placements. The patient elected to undergo an in-office surgery for both right carpal tunnel release and right A1 pulley release of the middle finger.

A solution of 10 mL 1% lidocaine and 10 mL 0.25% bupivacaine with epinephrine (1:100,000) was injected between the 2 surgical sites, around the right carpal tunnel and right middle finger A1 pulley as previously described.<sup>3</sup> In the palm, injections were given directly under the skin, above the flexor tendon sheath; in line with the third ray and distal palmar crease. The injections were given at 8:00 AM. Both surgeries were

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performed 30 minutes following the injections without complications. The patient tolerated the procedure well and left the office at 10:00 AM displaying pink digits with 2 seconds of capillary refill as confirmed by the attending hand surgeon (K.O.). Reportedly around 10:30 AM, the patient began to notice the first signs of circulatory compromise in her middle finger with a slightly dusky appearance at the tip of the digit. At 8:30 PM, 10 hours after discharge, the patient contacted the hospital and forwarded a picture of her hand, demonstrating a dusky-appearing middle finger distal to the proximal interphalangeal joint (Fig. 1). She was instructed to report to the emergency department immediately. On arrival at 10:30 PM, the patient continued to have numbness in the median nerve distribution with decreased capillary refill of the middle finger (Fig. 2A).

At 10:35 PM, the patient received 1.5 mg of phentolamine in 1 mL of 2% lidocaine at the base of the proximal phalanx of the right middle finger. The hand was placed in warm blankets with heat packs and a diagnostic vascular ultrasound (DVU) scan was ordered. At 11:30 PM, 1 hour after phentolamine injection, the finger demonstrated marked improvement in color (Fig. 2B). At 12:00 AM, 1.5 hours after phentolamine injection, return of circulation was complete, although residual numbness remained (Fig. 2C). Diagnostic vascular ultrasound scan demonstrated normal digital pressures and waveforms. Further inquiry revealed a history of cold intolerance during winter months with her fingers occasionally turning blue. The patient was discharged on a 5-day course of 20 mg of verapamil.

At her 3-week follow-up, the patient reported complete resolution of the sensory disturbance in the median nerve distribution and requested to have surgery for her left carpal tunnel syndrome. This time, surgery was performed with a wrist tourniquet and the same local anesthetic agents (5 mL 1% lidocaine with 5 mL 0.25% bupivacaine) were used without epinephrine. The patient tolerated the procedure well with no signs of circulatory compromise.

## DISCUSSION

Performing basic hand procedures in the wide-awake patient under local anesthesia in the office setting has become increasingly popular. This setup offers many advantages to both patients and providers. From a patient perspective, there is typically no required preoperative visit, a shorter visit time, less preoperative anxiety, decreased narcotic need, and avoidance of general anesthesia and its after effects.<sup>4</sup> Patient



**FIGURE 1:** Dusky-appearing middle finger distal to the proximal interphalangeal joint at 8:30 PM, 12.5 hours after injection.

satisfaction is high, with studies showing that over 85% of patients would prefer wide-awake surgery when undergoing another surgery in the future and 90% of patients would recommend the procedure to a friend.<sup>4,5</sup> Benefits to the provider include active participation and assessment during the procedure along with decreased costs and increased efficiency compared with performing the same procedure in the operating room.<sup>6,7</sup> Wide-awake hand procedures achieve hemostasis in the operative field through injection of epinephrine, thus circumventing the need for a tourniquet and either general or regional anesthesia typically required for tourniquet pain.

Epinephrine is a nonselective agonist of adrenergic receptors. When injected locally, epinephrine causes vasoconstriction of blood vessels in the skin and subcutaneous tissue providing improved hemostasis and prolonged anesthetic duration. The use of epinephrine as an adjunct to control bleeding in hand surgery has become increasingly popular because its safety has been well established in large clinical studies and because historical complications previously attributed to epinephrine have been proven to be due to other factors.<sup>2,8–11</sup> In a large, prospective multicenter trial involving over 3,100 patients

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